Aerogel Scattering Filters for Millimeter and Sub-mm Astrophysics

Completed Technology Project (2017 - 2018)

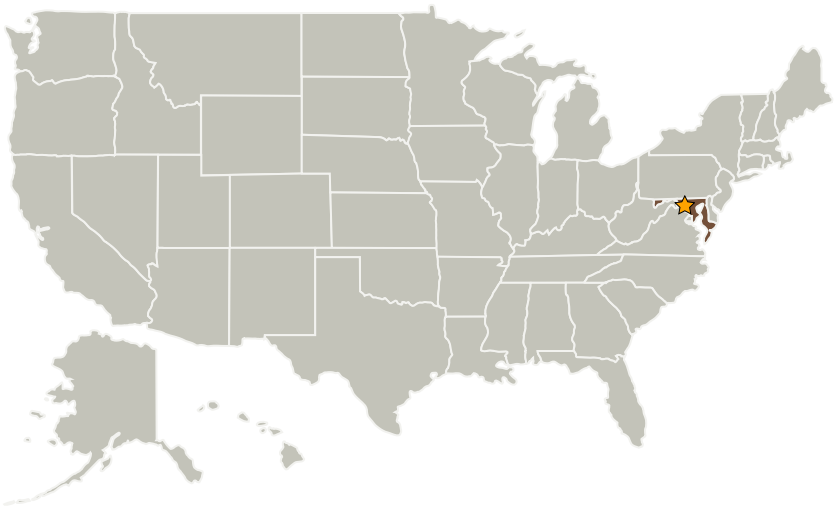
Project Introduction

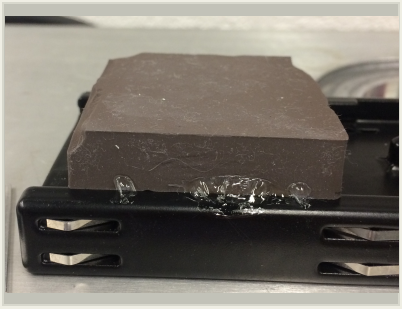
We are developing infrared-blocking filters for millimeter and sub-millimeter astronomy composed of small scattering particles embedded in an aerogel substrate. The ultra-low-density aerogel substrate has a low index of refraction, removing the need for an anti-reflection coating and allowing for ultra-broadband operation across the full range from zero frequency to 10 THz. The size of the scattering particles can be tuned to give variable cutoff frequencies. This technology would be key in enabling a broad range of missions, including Inflation Probe and future SOFIA instruments. Small scale prototypes have been made and measured to have excellent rejection of infrared radiation and variable cutoff frequency. Further technology development is required to (1) demonstrate the ability to scale the technology up to the full, roughly 30-cm-diameter size needed for Inflation Probe, (2) test the thermal filtering performance at the full size, and (3) investigate materials to extend the technology to higher frequencies.

Anticipated Benefits

Improved infrared-blocking filters with ultra-wide bandwidths.

Primary U.S. Work Locations and Key Partners





Photograph of sample in holder

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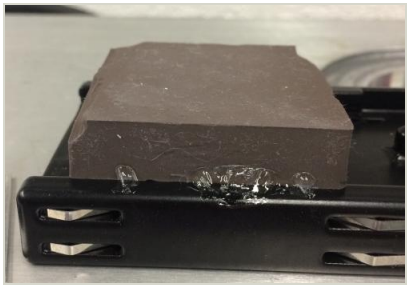
Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations
Maryland

Images



Aerogel SPF Sample
Photograph of sample in holder
(https://techport.nasa.gov/image/28199)

Organizational Responsibility

Responsible Mission Directorate:
Mission Support Directorate (MSD)

Lead Center / Facility:
Goddard Space Flight Center (GSFC)

Responsible Program:
Center Independent Research & Development: GSFC IRAD

Project Management

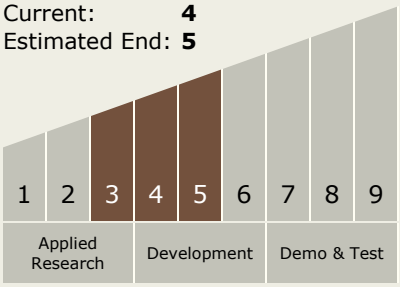
Program Manager:
Peter M Hughes

Project Managers:
Megan E Eckart
Timothy D Beach

Principal Investigator:
Thomas M Essinger-hileman

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **5**



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Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.4 Microwave, Millimeter-, and Submillimeter-Waves

Target Destinations

Earth, Outside the Solar System